Remarks

The Applicant has not cancelled any claims, and has added new Claims 10–12. Therefore Claims 1, 2, 4, 6, 7 and 9–12 are pending in this application. Claims 1, 6 and 11 are independent.

Claim Rejections Under 35 U.S.C. § 112, Second Paragraph

The Examiner has rejected Claims 6, 7 and 9 under 35 U.S.C. § 112, second paragraph, for failing to particularly point out and distinctly claim the subject matter which is regarded as the invention. In the after-final reply filed on 15 March 2010, the Applicant amended independent Claim 6 to clarify that the silica gel is "subjected to a first heat-treatment at 400 to 900°C". The Applicant thus respectfully submits that independent Claim 6 and all associated dependent claims now particularly point out and distinctly claim the subject matter which is regarded as the invention. The Applicant respectfully requests that the rejection of Claims 6, 7 and 9 under 35 U.S.C. § 112, second paragraph, be withdrawn.

Claim Rejections Under 35 U.S.C. § 103(a) (Kang + Duraiswami)

The Examiner has rejected Claims 1, 2 and 4 under 35 U.S.C. § 103(a) as being obvious based on U.S. Patent 5,650,129 ("Kang") in view of U.S. Patent 6,616,873 ("Duraiswami"). Claim 1 is independent and Claims 2 and 4 depend therefrom.

The Examiner acknowledges that neither Kang nor Duraiswami teach "heat-treating a silica gel by increasing its temperature at a speed of 5 to 90°C per minute," as is recited in independent Claim 1. Instead, the Examiner asserts that Kang teaches that "the **heat-treatment conditions** are result effective variables because they may be altered in order to optimize size, shape and microstructures of the resulting silica spheres" (emphasis added).

The Applicant respectfully submits that the Examiner has mischaracterized the teachings of Kang. What Kang **actually** states is that the properties of the resulting silica balls can be modified by controlling the properties of the silica gel and "**the heat-treating temperature**" (see Kang at 1:28–31; emphasis added). Independent Claim 1

recites not only a heat-treating temperature ("1050 to 1200°C"), but also an **elevating speed of temperature** ("5 to 90°C per minute").

Thus, not only does Kang fail to specifically teach the claimed range of elevating speed of temperature, Kang also fails to teach that the elevating speed of temperature is a result-effective variable. Kang only teaches that controlling "the heat-treating temperature" allows the properties of the resulting silica balls to be modified. Thus Kang does not recognize the **elevating speed of temperature** as a result-effective variable. A particular parameter must first be recognized as a result-effective variable before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation (see MPEP 2144.05(II)(B)).

Kang discloses a heat treatment that uses a relatively low rate of temperature increase: either 1°C min^{-1} or 2°C min^{-1} (see Kang at 3:1–7 and 3:16–17). This is substantially slower than the range of 5°C min^{-1} to 90°C min^{-1} which is recited in independent Claim 1. Increasing the temperature at a higher rate provides several important advantages compared to the lower rates disclosed in Kang. For example, when the temperature is increased too slowly, such as at the 1°C min^{-1} or 2°C min^{-1} rates that Kang discloses, moisture within the silica gel disappears almost completely. This prevents the interior of the silica gel from foaming uniformly, which disadvantageously results in an uneven density of the resulting silica spheres. This effect is described in the originally filed application disclosure; see Paragraph **[0009]** of the published patent application.

This effect is also illustrated in the experimental results provided in the Rule 132 Declaration of Sun-uk Kim that was submitted on 26 June 2009, which is hereinafter referred to as the "Kim Declaration". Specifically, the Kim Declaration shows that when the slow (1°C min^{-1} or 2°C min^{-1}) temperature increase of Kang is used, the result is either a failure to foam (Experiment 1) or over-foaming (Experiment 2).

These problems illustrated in the Kim Declaration are reduced or avoided when the temperature is increased faster. The originally field application disclosure describes several experiments that were conducted using temperature increase rates of 5°C min^{-1} or greater. In these experiments, the silica gel foamed substantially uniformly, resulting

in silica spheres with a homogeneous internal structure. See, for example, Example 1 (paragraph **[0052]** of the published application) and Figure 3, which illustrate the results of one such experiment.

Because Kang does not recognize the claimed elevating speed of temperature as a result-effective variable, it would not have been obvious to modify the teachings of Kang to obtain the claimed invention. The disclosure of Duraiswami cannot remedy the shortcomings of Kang. The Applicant therefore respectfully submits that independent Claim 1 is allowable over the combined teachings of Kang and Duraiswami, and respectfully requests that this rejection be withdrawn. In addition, because Claims 2 and 4 depend from independent Claim 1, and more specifically define the claimed invention, the Applicant respectfully submits that Claims 2 and 4 are allowable over the combined teachings of Kang and Duraiswami for at least the same reasons that independent Claim 1 is allowable. The Applicant therefore respectfully requests that the rejection of Claims 2 and 4 based on Kang and Duraiswami be withdrawn.

Claim Rejections Under 35 U.S.C. § 103(a) (Kang + Dobson + Duraiswami)

The Examiner has rejected Claims 6, 7 and 9 under 35 U.S.C. § 103(a) as being obvious based on Kang in view of U.S. Patent 4,392,988 ("Dobson") and Duraiswami. Claim 6 is independent and Claims 7 and 9 depend therefrom.

The Examiner acknowledges that neither Kang, Dobson nor Duraiswami teach a heat treatment process wherein silica gel is subjected to a first heat-treatment in which the temperature "is increased at an average speed of 35 to 70°C per minute," as is recited in independent Claim 6. Instead, the Examiner asserts that Kang teaches that "the **heat-treatment conditions** are result effective variables because they may be altered in order to optimize size, shape and microstructures of the resulting silica spheres" (emphasis added). As noted previously, this is a misrepresentation of the teachings of Kang. What Kang **actually** states is that the properties of the resulting silica balls can be modified by controlling the properties of the silica gel and "**the heat-treating temperature**" (see Kang at 1:28–31; emphasis added). Independent Claim 6 recites not only a heat-treating temperature for a first heat-treatment ("400 to 900°C"),

but also an **elevating speed of temperature** for the first heat-treatment ("35 to 70°C per minute").

Kang discloses a heat treatment that uses a relatively low rate of temperature increase: either 1°C min^{-1} or 2°C min^{-1} (see Kang at 3:1–7 and 3:16–17). This is substantially slower than the range of 35°C min^{-1} to 70°C min^{-1} which is recited in independent Claim 6. As discussed above, increasing the temperature at a higher rate provides several important advantages compared to the lower rates disclosed in Kang.

Because Kang does not recognize the claimed elevating speed of temperature as a result-effective variable, it would not have been obvious to modify the teachings of Kang to obtain the claimed invention. The disclosure of neither Dobson nor Duraiswami can remedy the shortcomings of Kang. The Applicant therefore respectfully submits that independent Claim 6 is allowable over the combined teachings of Kang, Dobson and Duraiswami, and respectfully requests that this rejection be withdrawn. In addition, because Claims 7 and 9 depend from independent Claim 6, and more specifically define the claimed invention, the Applicant respectfully submits that Claims 7 and 9 are allowable over the combined teachings of Kang, Dobson and Duraiswami for at least the same reasons that independent Claim 6 is allowable. The Applicant therefore respectfully requests that the rejection of Claims 7 and 9 based on Kang, Dobson and Duraiswami be withdrawn.

New Claims 10–12

The Applicant has added new Claim 10, which depends from independent Claim 1. New Claim 10 recites that "the porous silica sphere has a filling density between about 0.18 g mL^{-1} and about 0.30 g mL^{-1}". This feature was fully disclosed in the originally filed application disclosure; for example, see Paragraph **[0040]** of the published patent application. It would not be obvious to combine the teachings of Duraiswami and Kang to achieve a porous silica sphere having the claimed filling density using a rotary tube furnace.

The Applicant has added new independent Claim 11 and corresponding dependent Claim 12. Claim 11 recites a heat-treatment that includes "a temperature

increasing stage of duration about *n*/2 minutes, and a temperature maintaining stage of duration about *n*/2 minutes". This feature was fully disclosed in the originally filed application disclosure; for example, see Paragraph **[0033]** of the published patent application. This feature is new and nonobvious over the art of record.

No Disclaimers or Disavowals

Although this communication may include amendments to the application, and may characterize the claim scope and/or referenced art, the Applicant does not concede that previously pending claims are not patentable over the cited references. Rather, any amendments and/or characterizations are being made to facilitate expeditious prosecution of this application. The Applicant reserves the right to later pursue any previously pending or other broader or narrower claims that capture any subject matter supported by the present disclosure, including subject matter found to be specifically disclaimed herein or by any prior prosecution. Accordingly, reviewers of this or any parent, child or related prosecution history cannot reasonably infer that the Applicant has made any disclaimers or disavowals of any subject matter supported by the present disclosure.

Conclusion

In view of the foregoing, this application is believed to be in condition for allowance, and such allowance is respectfully requested. Should the Examiner believe that a telephone conference or personal interview would facilitate resolution of any remaining matters, the Examiner may contact the Applicant's attorney at the number given below.

The Commissioner is authorized (a) to charge LEXYOUME's Deposit Account No. 504054 for any fees required under 37 C.F.R. §§ 1.16 and 1.17 that are not covered, in whole or in part, by a credit card payment form submitted herewith, and (b) to credit any overpayment to said Deposit Account No. 504054.

Respectfully submitted,

/jwkim/

Jongwon Kim
Limited Recognition No. L0224

LEXYOUME IP GROUP, PLLC
5180 Parkstone Dr., Suite 175
Chantilly, VA 20151
Telephone: (703) 263-9390
Fax: (703) 263-9361
PTO Customer No. 66,390